

**PORTABLE CHAIN SAW****Patent number:** WO9205003**Publication date:** 1992-04-02**Inventor:** TALLBERG ERNST (SE)**Applicant:** TALLBERG ERNST (SE)**Classification:****- International:** B23D57/02; B27B17/08**- european:** B27B17/00G, B27B17/02, B27B17/08D, B27B33/14C9**Application number:** WO1990SE00608 19900924**Priority number(s):** SE19890001038 19890323**Also published as:**

EP0550433 (A1)

SE8901038 (L)

**Cited documents:**

DE495132

DE656811

DE674773

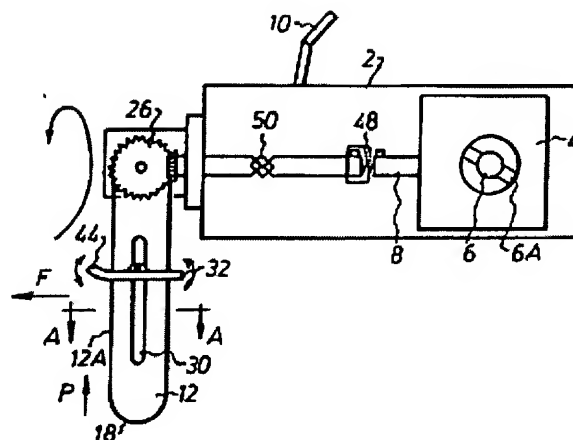
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**Abstract of WO9205003**

The invention relates to a hand tool comprising an elongate body (2), a reduction gear (4) mounted in the body, a guide bar (12) around which a cutting chain (18) runs, and transmission means for transmitting the output torque of the reduction gear to the cutting chain (18). The guide bar (12) is pivotable about an axis substantially parallel with the longitudinal axis of the body and extends in a plane parallel with the pivot axis. Moreover, the guide bar (12) is fixable in an optional position about said axis, while extending substantially perpendicular to the longitudinal direction of the body.



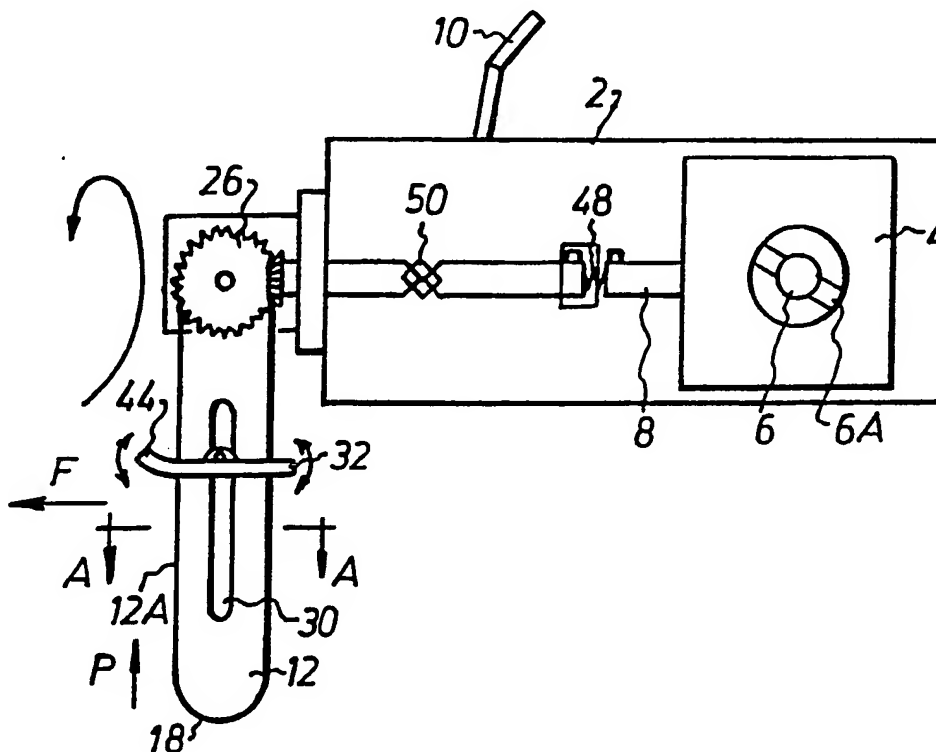
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>5</sup> :	A1	(11) International Publication Number:	WO 92/05003
B23D 57/02, B27B 17/08		(43) International Publication Date:	2 April 1992 (02.04.92)
(21) International Application Number: PCT/SE90/00608		<b>Published</b> <i>With international search report.</i> <i>In English translation (filed in Swedish).</i>	
(22) International Filing Date: 24 September 1990 (24.09.90)			
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(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent)*, DK (European patent), ES (European patent), FI, FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), NO, SE (European patent), US.			

**(54) Title: PORTABLE CHAIN SAW**



**(57) Abstract**

The invention relates to a hand tool comprising an elongate body (2), a reduction gear (4) mounted in the body, a guide bar (12) around which a cutting chain (18) runs, and transmission means for transmitting the output torque of the reduction gear to the cutting chain (18). The guide bar (12) is pivotable about an axis substantially parallel with the longitudinal axis of the body and extends in a plane parallel with the pivot axis. Moreover, the guide bar (12) is fixable in an optional position about said axis, while extending substantially perpendicular to the longitudinal direction of the body.

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PORTABLE CHAIN SAW

The present invention relates generally to a tool for non-sparking cutting of metal, such as motor-car  
5 metal sheeting, and more particularly to a hand tool which is useful especially in life-saving service.

German Patent 807,578 discloses a hand tool having a plate-shaped metal saw blade. The tool is driven by an electric motor provided with a reduction gear so as to  
10 rotate the saw blade at 60-150 rpm. The invention described in this patent is intended to facilitate, for example, the cutting of sectional elements and massive workpieces that were previously cut manually. The low speed of rotation of the saw blade implies that a cut is produced which  
15 does not require finishing.

This tool, however, is unsuitable as a rescue tool, even if the low speed of rotation of the saw blade, in case the tool is all the same used as a rescue tool, renders it possible to cut e.g. metal sheet without  
20 sparks being formed. Since the cutting depth of the known tool is very limited, and a different cutting blade of a greater diameter cannot be mounted on the tool without difficulties, the tool is most unsuitable as a rescue tool, when it is a matter of cutting e.g. the metal  
25 sheeting of a car and a beam located at a considerable depth in the car. Owing to the design of the prior art tool, it cannot in practice be used in narrow spaces.

French Patent 2,159,813 discloses a very simple, but still effective device for cutting in the first place, for  
30 example, metal bars in spaces difficult of access. A special chain for sawing e.g. metal is laid around the position in which the cutting is to be performed. The free ends of the chain are attached either to handles or to a manual or motor-driven rocker. The cutting chain extends  
35 around the sawing position and by intermittent motion, either manual or motor-driven, the chain effects the cutting of material. In a special embodiment of this French

patent, the free ends of the cutting chain are connected to each other so as to provide an endless cutting chain which is driven by a driving means. The chain must, however, still be laid around the cutting position.

- 5 Consequently it is impossible to cut by means of this saw e.g. the metal sheeting of a car to rescue a person locked up in the car and possibly injured.

Even if, in the construction of a rescue tool of the type mentioned by way of introduction, it cannot be con-  
10 sidered obvious, the prior art technique will nevertheless be accounted for, preferably in respect of woodworking hand tools fitted with cutting chains.

US Patent Specification 2,649,871 discloses a chain saw attachment for drills. This drill attachment is  
15 intended for use in, for example, firewood sawing and should replace or supplement existing chain saws. This attachment is extremely unsuitable as a professional rescue tool owing to its design and the inventive concept.

US Patent Specification 3,693,676 discloses a chain  
20 saw for cutting off underwater pilings and the like. It comprises a circular cutting support which adjacent the bottom of the sea serves as an abutment when cutting off objects in the water. The field of application and the mode of operation of the chain saw, however, distinguish  
25 considerably from those of the present specification.

US Patent Specification 2,708,953 discloses a chain saw for use in forestry, provided with a cutting support formed with teeth and mounted on a straight guide member. As appears from the specification below it is, however,  
30 impossible to use such a cutting support in the rescue tool according to the invention.

German Patent Specification 495,132 discloses a chain saw having a guide bar which is pivotable about a point P. This chain saw is especially suitable for stationary  
35 positioning when cutting logs. The guide bar thus is pivotable in a plane defined by the guide bar. The torque of the motor is transmitted via a long drive shaft and an

angular gear to the driving wheel of the cutting chain.

Finally, German Patent Specification 656,811 discloses a chain saw having a guide bar arranged perpendicular to the feeding direction of the saw.

5        Although the above-mentioned devices give ideas for solving some construction problems, they do not provide anything like a hand tool which is useful especially in life-saving service.

One object of the present invention thus is to provide a hand tool first of all for rescue operations, by means of which it is possible to cut, without risk of sparks being formed, metal, such as motorcar metal sheet and reinforcement beams, but also other metal objects where sparks could ignite inflammable fluids, such as  
10        highly inflammable gases.  
15

A second object of the present invention is to provide a tool having a great cutting depth, in which the cutting member can be angularly set in different planes for suitable use also in narrow spaces.

20        A third object of the present invention is to design a rescue tool in such a manner that metal chips do not get into the object which is being cut.

Moreover, the tool should be possible to use in combination with different driving systems, such as hydraulic, pneumatic or electric driving systems, and the cutting member should be easily replaceable when a greater cutting depth is required and for economic and convenient handling.  
25

These and other objects are achieved by means of a hand tool comprising an elongate body, a reduction gear mounted in said body, a guide bar around which a cutting chain runs, and transmission means for transmitting the output torque of said reduction gear to the cutting chain, said hand tool being characterised in that the guide bar  
30        is pivotable about an axis substantially parallel with the longitudinal axis of said body, that the guide bar extends in a plane parallel with the pivot axis, and that the  
35

guide bar is fixable in an optional position about said axis, while extending substantially perpendicular to the longitudinal direction of the body.

In a preferred embodiment of the present invention,  
5 the guide bar is a single plate-shaped member supporting elements which are U-shaped in cross-section and assembled to a chain. These elements have teeth arranged so that the teeth of consecutive elements form an unbroken sequence along the straight longitudinal sides of the guide bar.  
10 Furthermore, a cutting support is attached to the device and prevents it from being pulled into the object which is being cut. The device tending to be pulled into the object depends on a combination of the cutting direction and the driving direction of the cutting chain. To prevent cut  
15 material from getting into the object, for example when rescuing a person who is wedged in a car and who could be injured by the metal chips cut by the tool, the cutting chain according to the present invention comprises, along the edge of the guide bar facing away from the operator, teeth directed from the free end of the guide bar. Finally,  
20 the guide bar with the cutting chain is connected to a body of the device so as to be pivotable about an axis extending substantially perpendicular to the longitudinal axis of the body.

25 The enclosed drawing illustrates an embodiment of a hand tool according to the present invention, said embodiment being described in more detail below.

Fig. 1 is a schematic side view of an embodiment of a hand tool according to the invention, a protective cover  
30 being removed for better clarity.

Fig. 2 is a cross-sectional view of a guide bar according to the invention, taken along the line A-A in Fig. 1.

Fig. 3 is a side view of cutting chain elements  
35 according to the invention.

Fig. 4 is a cross-sectional view of a cutting chain element taken along the line B-B in Fig. 3.

Fig. 5 is a top plan view of one embodiment of a cutting support according to the invention.

5 Fig. 6 is a top plan view of a further embodiment of the cutting support according to the invention.

Fig. 1 illustrates an embodiment of a hand tool according to the invention, comprising a substantially elongate body 2 in which a reduction gear 4 is mounted.

10 The reduction gear has an input shaft 6 which via a coupling member 6A can be connected to any type of driving means.

The reduction gear 4 has such a ratio that its output shaft 8 has a speed of about 60 rpm. The speed of a cutting member can, however, be higher or lower depending on the design of a transmission means, but this will be discussed further down in the specification.

To the body and/or the reduction gear there is attached a displaceable handle 10 which permits balancing of the hand tool. A cooling and/or cutting fluid can be pumped by a pump to a nozzle via a flexible conduit which should be possible to direct, at least adjacent the nozzle, so that the cutting position is sprayed with the cooling and/or cutting fluid. At the side of the body 2 facing away from the reduction gear 4 there is arranged a guide bar 12 which extends perpendicular to the longitudinal direction of the body 2. The guide bar 12 is pivotable about an axis substantially parallel with the longitudinal axis of the body and is positioned in a plane parallel with the pivot axis. The guide bar 12 is fixable in an optional position about said axis by means of a tightening nut. The front edge of the guide bar is substantially straight and extends preferably perpendicular to the longitudinal axis of the body.

35 As is evident from Fig. 2, which is a cross-sectional view of the guide bar illustrated in Fig. 1, the guide bar 12 according to the invention comprises a single, massive



plate-shaped member. The guide bar 12 supports a cutting chain 18 composed of chain elements 14 shown in Figs 3 and 4 and provided with integrated teeth 16. Each element 14 is substantially U-shaped in cross-section (cf. Fig. 4). A plurality of teeth 16 which are connected with each other to form a unit 20 and positioned closely adjacent each other form the web, while legs 22, 24 connected to the unit 20 straddle the edge of the guide bar, the legs 22, 24 being designed to engage a sprocket 26 arranged on the guide bar. The sprocket is in turn connected to a bevel gear which allows the guide bar to pivot about an axis substantially parallel with the longitudinal axis of the body. Further the guide bar 12 is formed with an elongate slot 30 extending in the longitudinal direction of the guide bar. A cutting support 32 serving as an abutment is movably arranged in this slot. Fig. 5 shows a cutting support 32A according to the invention, having a centre slot 34 of such dimensions that the guide bar 12 can pass therethrough. Springs 40, 42 are arranged together with bearings 36, 38 mounted at the longitudinal sides of the slot, substantially in the central portion of the cutting support 32A and facing one another. A mounting bolt is inserted through the first spring 40 shaped as a coil spring, passes the first bearing 36, the slot 30, the second bearing 38 and the second spring 42 which is also shaped as a coil spring, and is secured in this position by means of e.g. a wing nut which is screwed onto a threaded end of the bolt. This arrangement permits the cutting support 32 to be pivoted against the action of the springs 40, 42 about the bolt extending perpendicular to the plane of the guide bar and serving on the one hand as a pivot pin, and, on the other hand, as a mounting element for the cutting support. The front edge 44 of the cutting support is bent off from the free end of the guide bar 12 for better adaptability to irregularities in the object that should be cut and to facilitate the pivoting movement described above.

Fig. 6 illustrates another cutting support 32B according to the invention, the construction details and function of which essentially correspond to those described with reference to Fig. 5, and therefore the details will not be described once more. The difference between the cutting support 32B shown in Fig. 6 and the cutting support 32A in Fig. 5 is that the cutting support 32B does not fully enclose the guide bar, but is formed with an open slot 46. To achieve the intended technical effect, the cutting support should, however, substantially enclose the guide bar 12.

Again, reference is now made to Fig. 1. The output shaft 8 of the reduction gear is connected to the bevel gear via a coupling member 48, which in turn is connected to a coupling handle, and a universal joint 50. Owing to the universal joint, the guide bar is movable about an axis extending substantially perpendicular to the longitudinal axis of the body 2, thereby allowing minor changes of the cutting direction.

For operating the device according to the invention, a suitable driving means (not shown) is connected to the coupling member 6A of the input shaft 6 of the reduction gear 4. After starting the driving means, the torque of the reduction gear 4 is transmitted to the sprocket 26. In addition to the convenience of being able to stop the cutting chain when required, this function also constitutes a most important safeguard, viz. a so-called dead man's handle. If the device according to the invention should be pulled away from the operator's hands and he lets go of the coupling handle, or if he gets hurt and loosens his grip on the coupling handle, the cutting chain 18 will stop immediately.

When the operator thus presses the coupling handle, the cutting chain 18 begins to move in a direction which in Fig. 1 is indicated by arrow P. The device is applied to the surface to be cut, for example a crashed car, whereby the cutting chain immediately starts to cut

through the material. When a slit has been cut in the material, which is of such a length that the guide bar can be put through to the cutting support 32, the actual cutting operation begins. The operator pushes the device forward in a direction which in Fig. 1 is indicated by arrow F. Since the teeth 16 of the cutting chain along the edge 12A of the guide bar facing away from the operator are directed from the free end of the guide bar, the cutting chain cuts through the material from below and upwards, and the entire device tends to be pulled into the object that is being cut. This is prevented by the cutting support 32 which moreover follows the irregularities of the object that is being cut, as described above. During the entire cutting operation, the cutting position can be sprayed with cooling and/or cutting fluid which is pumped by the pump to the nozzle. The pump is suitably mounted on the output shaft 8 of the reduction gear 4. Since this shaft begins to rotate as soon as a driving means connected to the input shaft of the reduction gear is put into operation and, consequently, the pump would continuously pump the cooling and/or cutting fluid from a remote tank to the nozzle, a closing means in the form of a throttle valve is mounted between the pump and the nozzle.

The average expert of course realises that there may be other ways of transmitting the torque of the reduction gear to the drive shaft. For example, it would be possible to use pulleys and a driving belt travelling around the pulleys. Moreover, a worm gear or the like could be used in stead of the angular gear, which serves the desired purpose. It will also be appreciated that the device according to the invention is useful not only as a rescue tool, but it can be used in many other fields where non-sparking cutting of metal is desired.

The following items constitute a summary of the most significant advantages of the present invention:

(1) The device according to the invention permits non-sparking cutting of metal also at great depths and in narrow spaces.

(2) The device according to the invention is comparatively light and also very compact and well-balanced, which permits a functional and safe handling of the device in a rescue operation.

(3) The direction of motion of the chain relative to the cutting direction of the entire device prevents cut material from getting into the object that is being cut, which is of special importance when a person wedged in a crashed car should be rescued.

It will be appreciated that it is obvious to those skilled in the art to make modifications and changes of parts of the device according to the invention, and it is therefore understood that the accompanying claims should cover all the modifications and changes which fall within the scope of the inventive concept.

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## CLAIMS

1. Hand tool comprising an elongate body (2), a  
5 reduction gear (4) mounted in said body, a guide bar (12)  
around which a cutting chain (18) runs, and transmission  
means for transmitting the output torque of said reduction  
gear to the cutting chain, c h a r a c t e r i s e d in  
that an angular gear is arranged between said guide bar  
10 (12) and said transmission means in such a manner that the  
guide bar (12) is pivotable about an axis substantially  
parallel with the longitudinal axis of said body, that the  
guide bar (12) extends in a plane parallel with the pivot  
axis, and that the guide bar (12) is fixable in an optio-  
15 nal position about said axis, while extending substantial-  
ly perpendicular to the longitudinal direction of said  
body.

2. Hand tool as claimed in claim 1, c h a r a c -  
t e r i s e d in that the output torque of said reduction  
20 gear is transmitted, via a shaft extending substantially  
in the longitudinal direction of the tool, to said angular  
gear which is connected to a sprocket (26) for driving the  
cutting chain.

3. Hand tool as claimed in claim 2, c h a r a c -  
25 t e r i s e d in that said shaft is divided, and that a  
hinge (50) connects the shaft portions and allows a limit-  
ed pivoting movement of the guide bar about an axis  
extending substantially perpendicular to the longitudinal  
axis of said body.

30 4. Hand tool as claimed in any one of claims 1-3,  
c h a r a c t e r i s e d in that said guide bar (12) is  
a single plate-shaped, elongate member, that said cutting  
chain (18) is composed of a plurality of identical ele-  
ments (14) which are substantially U-shaped in cross-sec-  
35 tion, a tooth (16) forming the web, and the legs (22, 24)  
straddling the edge of the guide bar, that said elements  
are supported by the guide bar (12) which, via the legs of

the respective element, guides the chain (18), and that said legs are designed to engage the sprocket (26).

5. Hand tool as claimed in claim 4, c h a r a c -  
t e r i s e d in that each element of said cutting chain  
5 (18) is provided with a plurality of teeth (16) for  
cutting metal, which are connected with each other, there-  
by forming an easily replaceable unit.

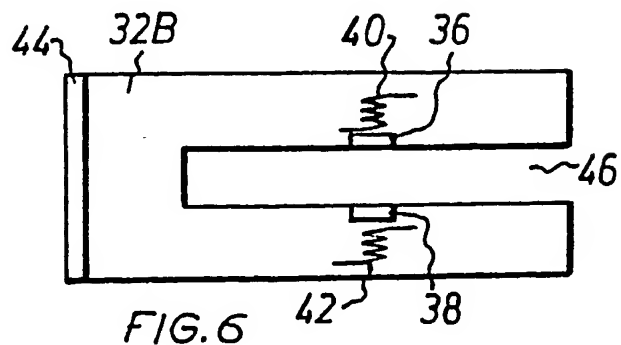
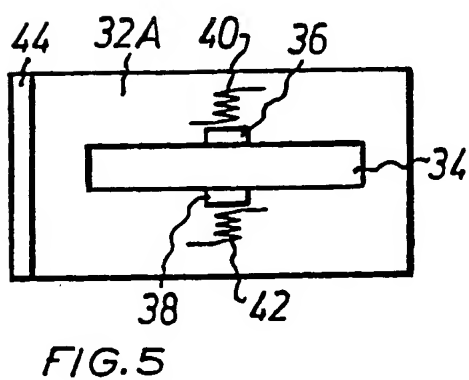
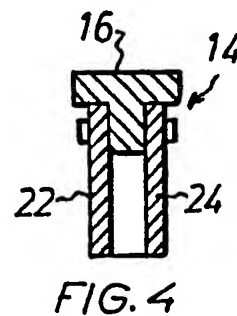
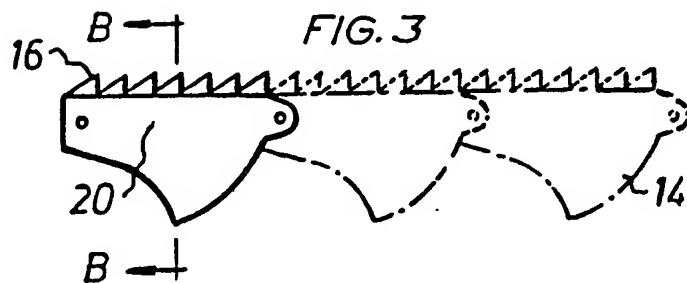
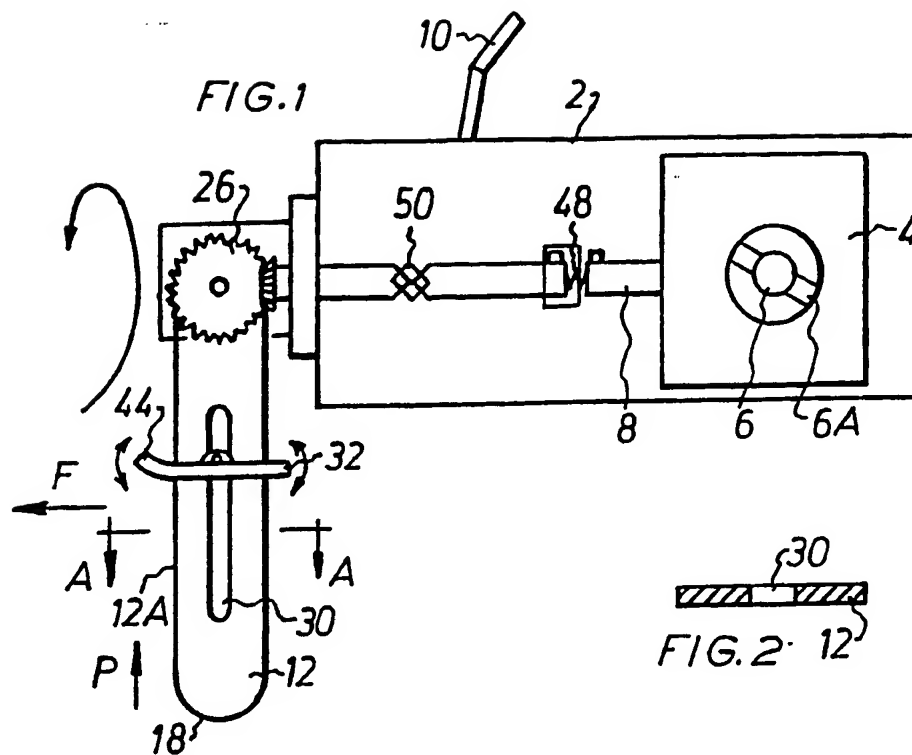
6. Hand tool as claimed in claim 5, c h a r a c -  
t e r i s e d in that the teeth (16) of a plurality of  
10 consecutive elements, at least along the straight longitu-  
dinal sides of the guide bar, form an unbroken sequence of  
teeth arranged closely adjacent each other.

7. Hand tool as claimed in any one of claims 1-6,  
c h a r a c t e r i s e d in that the cutting chain (18),  
15 along the edge (12A) of the guide bar facing away from the  
operator, comprises teeth directed from the free end of  
the guide bar.

8. Hand tool as claimed in any one of claims 1-7,  
c h a r a c t e r i s e d by a slot (30) formed in the  
20 guide bar (12) in the longitudinal direction thereof, and  
a cutting support (32; 32A; 32B) which is adjustable in  
longitudinal direction of said slot and substantially  
encloses the guide bar (12).

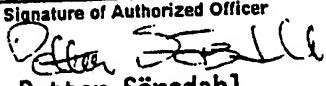
9. Hand tool as claimed in claim 8, c h a r a c -  
25 t e r i s e d in that the cutting support (32; 32A; 32B)  
is movable, against the action of a spring (40, 42), about  
an axis perpendicular to the plane of the guide bar.

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# INTERNATIONAL SEARCH REPORT

International Application No **PCT/SE 90/00608**

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>6</sup> According to International Patent Classification (IPC) or to both National Classification and IPC <b>IPC5: B 23 D 57/02, B 27 B 17/08</b>		
<b>II. FIELDS SEARCHED</b> <div style="text-align: right; font-size: small;">Minimum Documentation Searched<sup>7</sup></div>		
Classification System	Classification Symbols	
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Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched <sup>8</sup>		
<b>SE,DK,FI,NO</b> classes as above		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>		
Category *	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
A	DE, C, 495132 (RÜEGER) 2 April 1930, see the whole document --	1,3,8
A	DE, C, 656811 (DEMAG AG) 15 February 1938, see the whole document --	1
A	DE, C, 674773 (DOLMAR MASCHINEN-FABRIK) 21 April 1939, see figure 4; claim 1 --	1
A	DE, C, 807578 (OTTO BAIER K.-G.) 2 July 1951, see page 2, line 66 - line 70; figures 1,2 --	1,8
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>* Special categories of cited documents: <sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p> </div> </div>		
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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	FR, A5, 2159813 (COQUILLAT ET AL) 22 June 1973, see page 2, line 25 - line 36; figures 5,6 --	1
A	US, A, 3693676 (BURCH) 26 September 1972, see figures 1-4; claim 1 --	1
A	US, A, 2708953 (DIEHL) 24 May 1955, see column 1, line 45 - column 2, line 5; figures 1-4 --	1,4,8
A	US, A, 2649871 (DESBARAT) 25 August 1953, see column 3, line 1 - line 24; figures 1-6 -- -----	1,4-6

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.PCT/SE 90/00608**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.  
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-C- 495132	30-04-02	NONE	
DE-C- 656811	38-02-15	NONE	
DE-C- 674773	39-04-21	NONE	
DE-C- 807578	51-07-02	NONE	
FR-A5- 2159813	73-06-22	NONE	
US-A- 3693676	72-09-26	NONE	
US-A- 2708953	55-05-24	NONE	
US-A- 2649871	53-08-25	NONE	

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